

**Patent Claims**

1. Mixture for applying a polymeric, corrosion-resistant, electrically conductive coating which can be shaped in a low-abrasive manner to a substrate, in particular to a metallic substrate such as e.g. a steel sheet, it being possible for the substrate optionally to be precoated e.g. with at least one zinc layer or/and a zinc-containing alloy layer or/and with at least one pretreatment layer, wherein the mixture comprises, in addition to at least one substance A in the form of electrically conductive hard particles, at least one substance B in the form of very soft or soft, inorganic, electrically conductive or semiconducting particles which are capable of sliding or/and at least one substance C in the form of metallic, soft or hard, electrically conductive or semiconducting particles or/and carbon black and at least one binder and in each case at least one crosslinking agent or/and one photoinitiator and optionally also in each case at least one post-crosslinking compound, one additive, one corrosion protection pigment D, one corrosion inhibitor which is not present in particle form, one organic solvent or/and water, A, B and C being water-insoluble or sparingly water-soluble pigments, characterized in that the sum of the weight contents of the inorganic particles B which are capable of sliding and of the metallic particles or/and carbon black C makes up 0.25 to 99.5 % of the weight contents of the water-insoluble or

sparingly water-soluble pigmentation  $\Sigma$  (A + B + C),  
and in that the size of the electrically conductive  
hard particles A, based on the particle size  
passage value  $d_{99}$ , measured with a Mastersizer of  
5 type S from Malvern Instruments, is less than  
10  $\mu\text{m}$ .

2. Mixture according to claim 1, characterized in that  
the sum of the weight contents of the water-  
10 insoluble or sparingly water-soluble pigmentation  $\Sigma$   
(A + B + C) relative to the sum of the total  
pigmentation  $\Sigma$  (A + B + C + D) is 30 to 99 wt.%.

3. Mixture according to claim 1 or 2, characterized in  
15 that the mixture of all the types of electrically  
conductive hard particles A has an average particle  
size  $d_{50}$  in the range from 0.1 to 2.5  $\mu\text{m}$ , in  
particular in the range from 0.2 to 2  $\mu\text{m}$ .

20 4. Mixture according to one of the preceding claims,  
characterized in that the mixture of all the types  
of electrically conductive hard particles A has a  
steep particle size distribution in which the  
passage value  $d_{99}$  has a factor of at most 12  
25 relative to the passage value  $d_{10}$ .

5. Mixture according to one of the preceding claims,  
characterized in that on addition to the mixture,  
the mixture of all the types of very soft or soft  
30 particles B which are capable of sliding has a  
particle size passage value  $d_{99}$  in the range from 1  
to 30  $\mu\text{m}$ .

6. Mixture according to one of the preceding claims,  
characterized in that on addition to the mixture,  
the mixture of all the types of very soft or soft  
particles B which are capable of sliding has an  
5 average particle size  $d_{50}$  in the range from 0.1 to  
20  $\mu\text{m}$ .
7. Mixture according to one of the preceding claims,  
characterized in that on addition to the mixture,  
10 the average particle size  $d_{50}$  of the very soft or  
soft particles B which are capable of sliding is  
greater than the average particle size  $d_{50}$  of the  
electrically conductive hard particles A by a  
factor of 1.5 to 7.
- 15 8. Mixture according to one of the preceding claims,  
characterized in that on addition to the mixture,  
the mixture of all the types of metallic particles  
or/and carbon black C has a particle size passage  
20 value  $d_{99}$  in the range from 0.05 to 20  $\mu\text{m}$ .
9. Mixture according to one of the preceding claims,  
characterized in that on addition to the mixture,  
the mixture of all the types of metallic particles  
25 or/and carbon black C has an average particle  
size  $d_{50}$  in the range from 0.01 to 10  $\mu\text{m}$ .
10. Mixture according to one of the preceding claims,  
characterized in that on addition to the mixture,  
30 the average particles size  $d_{50}$  of the metallic  
particles or/and carbon black C is greater than the  
average particle size  $d_{50}$  of the electrically

conductive hard particles A by a factor of 0.1 to 4.

11. Mixture according to one of the preceding claims,  
5 characterized in that the content of electrically  
conductive hard particles A in the mixture is 10 to  
80 wt.% and the content in the mixture of very soft  
or soft particles B which are capable of sliding is  
0.1 to 16 wt.%, in each case based on the weight of  
10 the solid in the wet lacquer.
12. Mixture according to one of the preceding claims,  
characterized in that the content of metallic  
particles or/and carbon black C in the mixture is 0  
15 to 75 wt.%, based on the weight of the solid in the  
wet lacquer.
13. Mixture according to one of the preceding claims,  
characterized in that on addition to the mixture,  
20 the mixture of all the types of corrosion  
protection particles D has an average particle  
size  $d_{50}$  in the range from 0.01 to 5  $\mu\text{m}$ .
14. Mixture according to one of the preceding claims,  
25 characterized in that on addition to the mixture,  
the mixture of all the types of corrosion  
protection particles D has the particle size  
passage value  $d_{99}$  in the range from 0.03 to 10  $\mu\text{m}$ .
- 30 15. Mixture according to one of the preceding claims,  
characterized in that the electrically conductive  
hard particles A comprise substances based on  
compounds or mixtures of compounds with or of

- spinel, such as e.g.  $\text{Fe}_3\text{O}_4$ ,  $\text{Mn}_3\text{O}_4$ ,  $\text{FeMn}_2\text{O}_4$  or/and further substances based on borides, carbides, oxides, phosphates, phosphides, silicates, silicides or particles having an electrically conductive coating or/and a mixture thereof or a common compound thereof, and in that further metallic particles or/and carbon black C chosen from aluminium, iron, cobalt, copper, molybdenum, nickel, niobium, silver, tantalum, titanium, vanadium, tungsten, zinc, tin, aluminium-, iron-, cobalt-, copper-, molybdenum-, nickel-, niobium-, silver-, tantalum-, titanium-, vanadium-, tungsten-, zinc- or/and tin-containing alloys are optionally present.
16. Mixture according to one of the preceding claims, characterized in that at least 30 wt.% of the electrically conductive hard particles A are oxides or/and phosphides substantially based on aluminium, iron, cobalt, copper, manganese, molybdenum, nickel, niobium, tantalum, titanium, vanadium, tungsten, zinc or/and tin.
17. Mixture according to one of the preceding claims, characterized in that the very soft or soft particles B which are capable of sliding predominantly or entirely comprise graphite, sulfide, selenide or/and telluride, in particular graphite, antimony-containing sulfide, tin-containing sulfide, molybdenum-containing sulfide or/and tungsten-containing sulfide.

18. Mixture according to one of the preceding claims,  
characterized in that it comprises not more than  
0.5 wt.% of wax or/and of substances having wax-  
like properties, preferably not more than 0.2 wt.%,  
5 based on the dry weight of the wet lacquer,  
particularly preferably no wax and no substances  
having wax-like properties.
19. Process for the production of a corrosion-  
10 resistant, viscoelastic coating comprising polymers  
and inorganic particles on a substrate,  
characterized in that a mixture according to one of  
claims 1 to 18 is applied to an optionally  
precoated substrate, optionally dried and at least  
15 partly crosslinked.
20. Process according to claim 19, characterized in  
that the very soft or soft particles B which are  
capable of sliding, such as e.g. graphite, are in  
20 each case not ground or are ground with only a low  
intensity before addition to the mixture or in the  
mixture or/and in a portion of the mixture.
21. Process according to claim 19 or 20, characterized  
25 in that the electrically conductive hard particles  
A are ground by themselves.
22. Process according to one of claims 19 to 21,  
characterized in that on grinding of the  
30 electrically conductive hard particles A, the over-  
sized particles are predominantly comminuted, so  
that a narrower particle size distribution arises.

23. Process according to one of claims 19 to 22,  
characterized in that the particle size passage  
value  $d_{99}$  of the electrically conductive hard  
particles A is not substantially greater than, no  
greater than or only slightly less than the average  
thickness of the coating.
24. Process according to one of claims 19 to 23,  
characterized in that the mixture applied to the  
substrate is dried, stoved, irradiated with free  
radicals or/and heated in order to form a  
thoroughly crosslinked, corrosion-resistant,  
viscoelastic coating.
25. Process according to one of claims 19 to 24,  
characterized in that a coating having a thickness  
of less than 10  $\mu\text{m}$ , in particular less than 8  $\mu\text{m}$ ,  
preferably less than 6  $\mu\text{m}$  and particularly  
preferably of less than 4  $\mu\text{m}$ , measured in the dry  
state microscopically on a ground cross-section, is  
produced.
26. Process according to one of claims 19 to 25,  
characterized in that the mixture is free or  
substantially free from organic lubricants, such as  
e.g. based on PTFE, silicone or oil, inorganic  
or/and organic acids or/and heavy metals and other  
cations, such as arsenic, lead, cadmium, chromium,  
cobalt, copper or/and nickel.
27. Process according to one of claims 19 to 26,  
characterized in that the substrate comprises at  
least one metal or/and at least one alloy and is

optionally precoated, in particular comprises a sheet comprising aluminium, an aluminium, iron or magnesium alloy or steel, such as e.g. automobile steels.

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28. Process according to one of claims 19 to 27, characterized in that the mixture according to the invention is applied directly to a pretreatment coating.

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29. Electrically conductive coating comprising polymers and inorganic particles, produced using a mixture according to one of claims 1 to 18 or/and produced using a process according to one of claims 19 to 28.

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30. Use of the coating according to claim 29 as a welding primer, as a protective coating during shaping or/and joining, as corrosion protection of surfaces or in the edge, seam or/and welded seam region, as protection instead of a hollow cavity seal or/and a seam seal, in particular for vehicle construction or aircraft construction.

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